


GREEN, ENERGY & ENVIRONMENTAL AUDIT REPORT | 2019

M. S. Ramaiah University of Applied Sciences



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M.S. Ramaiah University of Applied Sciences
Bangalore - 560 054

GREEN AUDIT REPORT - 2019

is presented to

M. S. Ramaiah University of Applied Sciences

University House, New BEL Rd, M S R Nagar, Mathikere, Bengaluru, Karnataka

has successfully demonstrated knowledge on Energy conservation,
Water conservation, Bio diversity, Waste management, Indoor
Environmental quality, Carbon footprint.

23.01.2020

DATE

Nischay N.

NISCHAY N
GREEN BUILDING CONSULTANT

 **Green
Aura**
Built Environment Sustainability & Transformation


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Green, Energy and Environment Audit Report 2019



PREPARED FOR

M. S. Ramaiah University of Applied Sciences

Bengaluru, Karnataka – 560054

PREPARED BY

GREEN AURA

No 692f 12th A cross BEL layout Bharath Nagar,

Bangalore, Karnataka,

India, 560091

Year -2019


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ACKNOWLEDGEMENT

GREEN AURA, Bangalore, Karnataka takes this opportunity to appreciate & thank the management **M. S. Ramaiah University of Applied Sciences, Bangalore** for giving us an opportunity to conduct energy audit for the university.

We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.

Audit Team

The study team consisted of senior technical executives from Green Aura, and the audit spanned multiple visits from September to November 2019.

- ✿ **Mr. Nischay Gowda** [Director]
- ✿ **Mr. Sachin Kumawat** [Engineer]


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EXECUTIVE SUMMARY

The executive summary of the energy audit report furnished in this section briefly gives the identified energy conservation measures in the University.

AREAS FOR IMPROVEMENT

✦ LIGHTING SYSTEM

Replacement of “conventional T-12 (40 Watt) and T-8 (36 Watt)” tube light by energy efficient LED lighting fixture was taken up phased manner.

✦ CEILING FAN.

It is recommended to replace “conventional ceiling fan (80 Watt)” by energy efficient star rated BLDC based i.e. energy efficient fan (28 Watt) in university building etc. It has great potential for energy saving.



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I. Built Environment

i. Layout plan - Gnanagangothri Campus



M. S. Ramaiah University of Applied Sciences Gnanagangothri campus layout plan



M. S. Ramaiah University of Applied Sciences, Ramaiah Technology Campus layout plan


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Campus 1:**Gnana Gangotri (GG) New BEL Road, M S R Nagar, Bangalore, Karnataka, 560054****Campus 2:****Peenya Campus****427, 12th Cross Rd, Ganapathy Nagar, Phase 3, Peenya, Bengaluru, Karnataka 560058****ii. Total built-up area of the University**

| Gnanagangothri Campus | | | |
|-----------------------|---|----------------------|------------|
| Sl No. | Name of the Building | Floor | Area (Sft) |
| 1 | University House | Ground | 12675 |
| | | First | 20057 |
| | | Second | 17900 |
| 2 | Faculty of Dental Sciences | Basement | 13,850 |
| | | Ground | 30,374 |
| | | First | 29,623 |
| | | Second | 29,623 |
| 3 | Faculty of Management & Commerce and Faculty of Life & Allied Health Sciences | Third | 29,623 |
| | | Ground | 24,500 |
| | | First | 22,700 |
| 4 | Faculty of Hospitality Management & Catering Technology | Second | 22,700 |
| | | Third | 22,700 |
| | | Basement | 15,300 |
| | | Ground | 15,300 |
| 5 | Faculty of Pharmacy | First | 15,900 |
| | | Second | 15,900 |
| | | Third | 15,900 |
| | | Ground | 22,700 |
| 6 | Heritage Block (School of Social Sciences and School of Law) | First | 22,700 |
| | | Second | 27,000 |
| | | Third | 24,400 |
| | | Basement | 6,675 |
| 7 | Ramaiah Medical College | Ground | 31,445 |
| | | First | 28,000 |
| | | Second | 28,853 |
| | | Third | 28,000 |
| 8 | Ramaiah Medical College Hospital | Lower Basement | 65,250 |
| | | Upper Basement | 52,780 |
| | | Ground | 60,270 |
| | | First | 59,880 |
| | | Second | 56,590 |
| 9 | Ramaiah Institute of Nursing Education and Research | Third | 58,230 |
| | | Lower Basement 3 and | 31,103 |
| | | Upper Basement 1 | 1,17,316 |
| | | Ground | 1,17,144 |
| | | First | 1,17,144 |
| 10 | Triveni Girls Hostel and Nilgiris Boys Hostel | Second | 85,459 |
| | | Third | 24,074 |
| | | Ground | 12,702 |
| | | First | 12,702 |
| 11 | Sapthagiri Hostel | Second | 12,702 |
| | | Third | 12,702 |
| | | Ground | 12,702 |
| | | First | 12,702 |
| 12 | Faculty Residence – Tulasi Staff Quarters | Lower Basement | 70,913 |
| | | Upper Basement | 69,387 |
| | | Ground | 42,338 |
| | | First | 42,338 |
| | | Second | 42,338 |
| 11 | Sapthagiri Hostel | Third | 42,338 |
| | | Ground | 19,752 |
| | | First | 19,752 |
| 12 | Faculty Residence – Tulasi Staff Quarters | Second | 19,752 |
| | | Stilt Floor | 3,200 |
| | | Ground + 2 Typical | 9,600 |


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| Ramaiah Technology Campus | | | |
|---------------------------|----------------------|----------|------------|
| Sl. No. | Name of the Building | Floor | Area (Sft) |
| 1 | A Block (RTC) | Basement | 10,600 |
| | | First | 10,600 |
| | | Second | 12,100 |
| | | Third | 12,100 |
| 2 | B Block (RTC) | Upper | 10,600 |
| | | Ground | 10,600 |
| | | First | 10,600 |
| | | Second | 10,600 |
| 3 | C Block (RTC) | Third | 10,600 |
| | | Lower | 8,600 |
| | | Upper | 10,200 |
| | | Ground | 10,200 |
| 4 | D Block (RTC) | First | 10,200 |
| | | Second | 10,200 |
| | | Third | 10,200 |
| | | Upper | 8,600 |

iii. Total Population of the Institution.

As a primary data collected by survey, we found

| Sr. No. | Particulars | Details |
|---------|----------------------------|---------|
| 1 | Students staying at Hostel | 150 |
| 2 | Students at College | 1168 |
| 3 | Teaching Staff | 368 |
| 4 | Non-Teaching Staff | 315 |
| 5 | Visitors | 150 |
| | Total | 2294 |

iv. Facilities available in the campus.

| Facilities | Present in the campus (yes/no) | |
|-----------------------------|--------------------------------|---------------------|
| | GG Campus | Peenya Campus |
| Garden Area | Yes | Yes |
| Play ground | Yes | Yes |
| Kitchen | Yes | Yes |
| Toilets (numbers) | 103 | 245 |
| Garbage or waste store yard | Yes | Yes |
| Laboratory (numbers) | 70 | 46 |
| Canteen | 30 stalls (food street) | 1 canteen+1(eatery) |

III. Energy Audit

i. Objectives of Energy Auditing

The primary object of an energy audit is to assess and analyze the energy usage and efficiency of a building, facility, or process. Energy audits are conducted to achieve several specific goals and objectives, including

1. Identify Energy Efficiency Opportunities.
2. Fixing of energy saving potential targets for individual cost centers
3. To reduce operational costs.
4. To reduce energy consumption per unit product output.
5. Improve Energy Performance.
6. Relating energy inputs and production output
7. To find and apply effective planning for more effective use of energy throughout the industry works.
8. Identifying potential areas thermal and electrical energy efficiency.

POWER SUPPLY SYSTEM

Part-01 (Gnanagangothri Campus)

Transformer

There is one main electricity connection is 2151 KVA (The Register, M.S. Ramaiah Medical College Bangalore) and for each building they have sub meters for reading consumption details. This campus has one transformer details are below

| Sr. No. | Items | Technical Details Transformer (TR) |
|---------|-------------------------|--|
| 1 | Make | (KPRS) Kiran Power Rectification Services (P) Ltd. |
| 2 | Location | Gnanagangothri Campus |
| 3 | Year | 2012 |
| 4 | Rating (KVA) | 1000 |
| 5 | Voltage (HV/ LV) | 11000/433 |
| 6 | Current Rating (HV/ LV) | 52.48/1333.33 |
| 7 | Frequency (Hz) | 50 |
| 8 | Impedance at 75°C | 5.12 % |
| 9 | Vector group | Dyn-11 |
| 10 | Type of cooling | ONAN |



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DG SETS

The GG Campus has 02 Nos. DG sets one is 500 KVA and second is 320 KVA both for supply emergency power during the grid power failure.

| Sr. No. | Parameter | Technical Specification DG Set-01 | Technical Specification DG Set-01 |
|---------|----------------|-----------------------------------|-----------------------------------|
| 1 | Make | Cummins | Cummins |
| 2 | Model No | VTA28 | 1150G |
| 3 | Capacity (KVA) | 500 | 320 |
| 4 | Rated Voltage | 415 | 415 |
| 5 | ESN | 25166387 | 25168243 |
| 6 | Frequency | 50 | 50 |
| 7 | Phase | 3 | 3 |

GRID CONNECTED SOLAR PHOTOVOLTAIC SYSTEM (20 KWp)

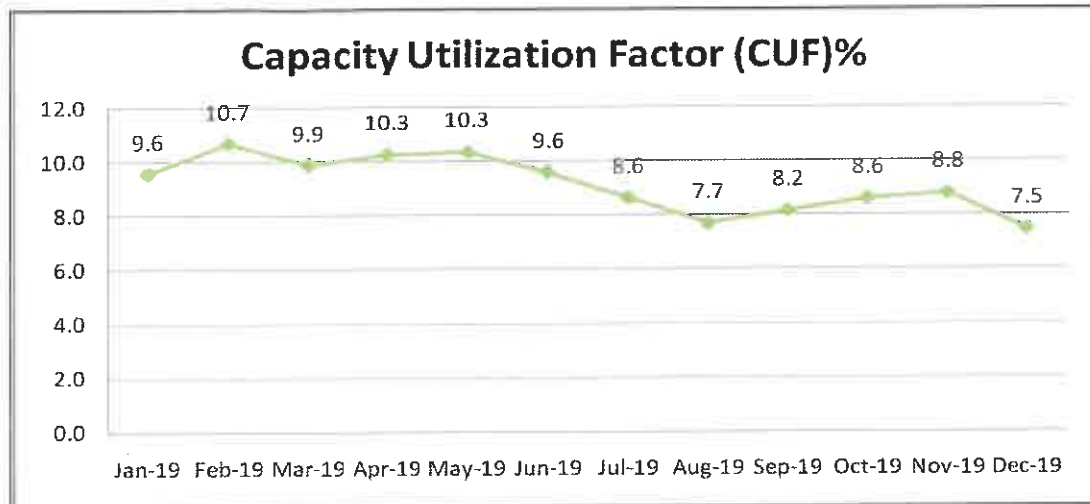
There is a 20 KWp solar photovoltaic rooftop grid-connected system installed on various buildings. System details are given below: Solar plant detailed

| Sr. No | Parameter | Technical Details |
|--------|----------------------|------------------------------|
| 1 | Make | Tata Power Solar System Ltd. |
| 2 | Solar Capacity | 20 KWp |
| 3 | System Type | On Grid Type |
| 4 | No. of Solar Modules | 88Nos. |
| 5 | Solar Modules Watts | 250 Watts |

Solar unit generation Year-2019:-

Monthly Solar unit generation Year-2019

| Sr. No. | Month & Year | Solar Unit Generation (KWp) | No of Days | Capacity Utilization Factor (CUF)% |
|--------------|--------------|-----------------------------|------------|------------------------------------|
| 1 | Jan-19 | 2,492 | 31 | 9.6 |
| 2 | Feb-19 | 2,510 | 28 | 10.7 |
| 3 | Mar-19 | 2,570 | 31 | 9.9 |
| 4 | Apr-19 | 2,587 | 30 | 10.3 |
| 5 | May-19 | 2,691 | 31 | 10.3 |
| 6 | Jun-19 | 2,417 | 30 | 9.6 |
| 7 | Jul-19 | 2,251 | 31 | 8.6 |
| 8 | Aug-19 | 2,002 | 31 | 7.7 |
| 9 | Sep-19 | 2,056 | 30 | 8.2 |
| 10 | Oct-19 | 2,240 | 31 | 8.6 |
| 11 | Nov-19 | 2,219 | 30 | 8.8 |
| 12 | Dec-19 | 1,943 | 31 | 7.5 |
| Total | | 27,978 | 365 | 9.1 |



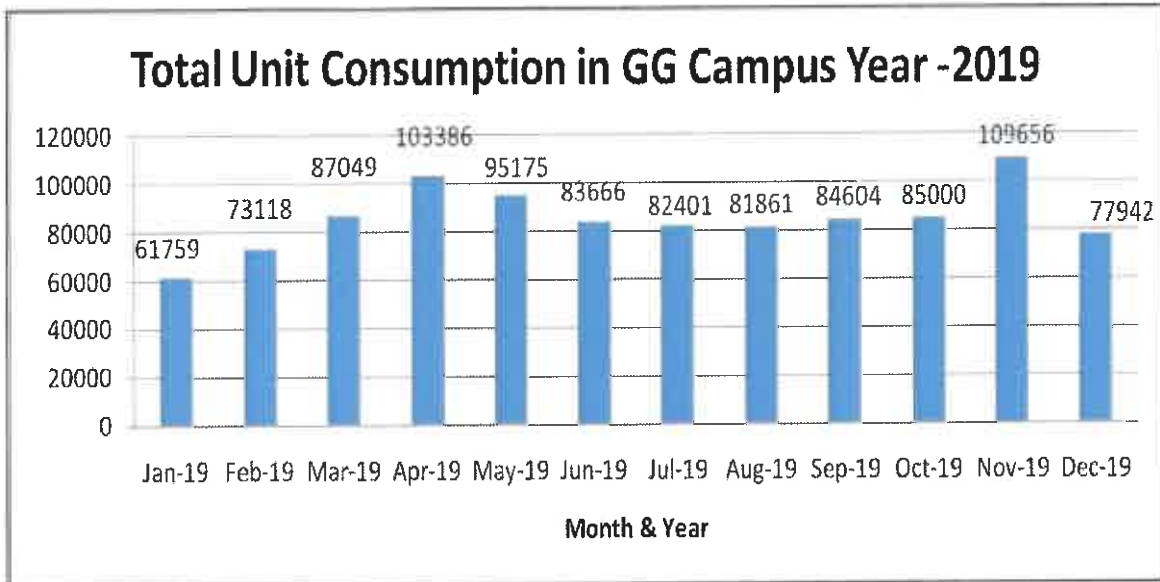
Observation:- University has installed 20 KWp solar system on GG Campus buildings. Total solar unit generation is 27,978 kWh in the year-2019. And CUF is 9.1 %.

ENERGY CONSUMPTION ANALYSIS

Energy audit team was analysed Electricity bills of last one year- 2019(GG Campus)

| Sr. No. | Month & Year | UAS | ALC | FDS | FMC | FHMC T | FP H | Street Light | Total(kWh) |
|---------|--------------|-----------|-----------|-----------|-----------|--------|----------|--------------|------------|
| 1 | Jan-19 | 2323 | 2750 4 | 1835 2 | 4047 | 5771 | 376 2 | 0 | 61,759 |
| 2 | Feb-19 | 2391 | 3856 3 | 1508 1 | 4479 | 8470 | 413 4 | 0 | 73,118 |
| 3 | Mar-19 | 4730 | 4350 4 | 1759 3 | 4800 | 11480 | 494 2 | 0 | 87,049 |
| 4 | Apr-19 | 6313 | 5337 6 | 2281 6 | 4663 | 11630 | 458 8 | 0 | 1,03,386 |
| 5 | May-19 | 5963 | 4495 1 | 2282 8 | 5150 | 11150 | 476 0 | 373 | 95,175 |
| 6 | Jun-19 | 4306 | 4067 7 | 2096 0 | 4542 | 8962 | 421 9 | 0 | 83,666 |
| 7 | Jul-19 | 4102 | 3908 6 | 2577 8 | 1699 | 8127 | 360 9 | 0 | 82,401 |
| 8 | Aug-19 | 2910 | 4006 3 | 2049 8 | 6500 | 8091 | 379 9 | 0 | 81,861 |
| 9 | Sep-19 | 2887 | 4266 1 | 1734 0 | 1061 8 | 7006 | 409 2 | 0 | 84,604 |
| 10 | Oct-19 | 2962 | 4256 0 | 1923 0 | 7349 | 8601 | 429 8 | 0 | 85,000 |
| 11 | Nov-19 | 2080 0 | 4627 0 | 2291 1 | 7349 | 8331 | 399 5 | 0 | 1,09,656 |
| 12 | Dec-19 | 2040 | 3459 2 | 1617 6 | 7098 | 5752 | 380 4 | 8480 | 77,942 |


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Graphical presentation of Energy consumption of GG campus.

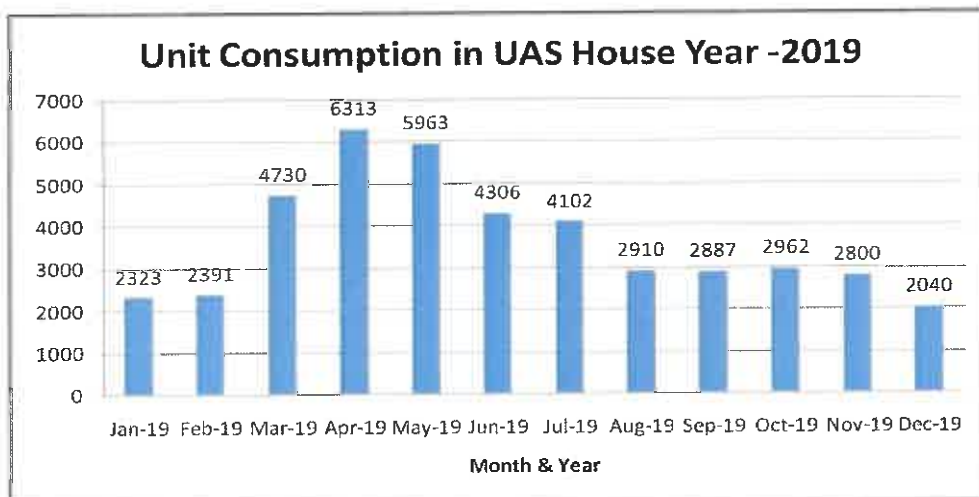
Observation

- ✚ Total energy consumption of the GG Campus is 10, 25,617 units during period Jan-2019 to Dec-2019.
- ✚ University has a sub meter for every building in GG Campus

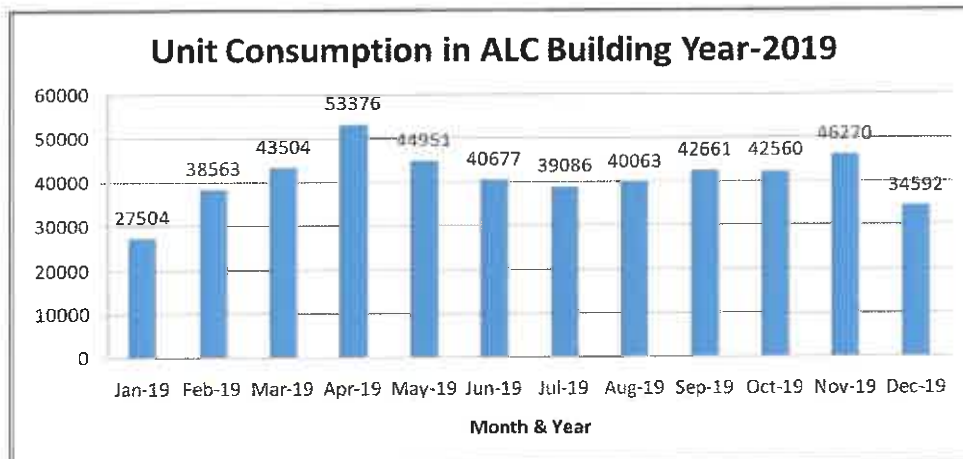
Recommendation:

Installation of “Cloud based (IoT based) energy monitoring system” including harmonic measurement (total voltage and current harmonic distortion %) every building. It will be good initiative for energy monitoring by university side.

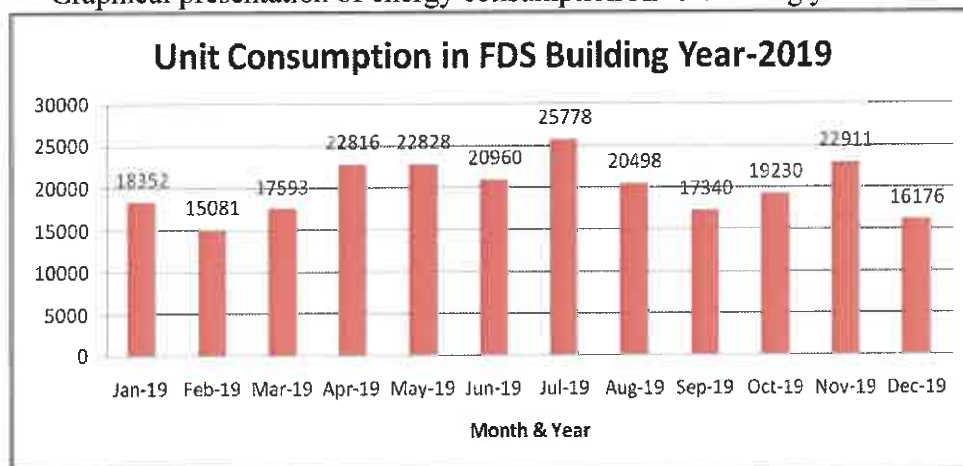
Graphical Presentation of all building unit consumptions is below



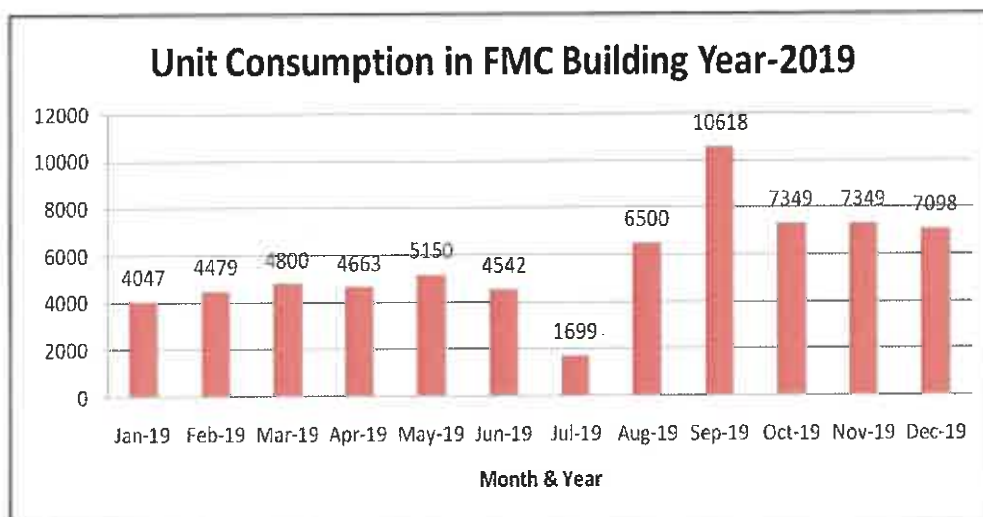
Graphical presentation of energy consumption UAS house year-2019



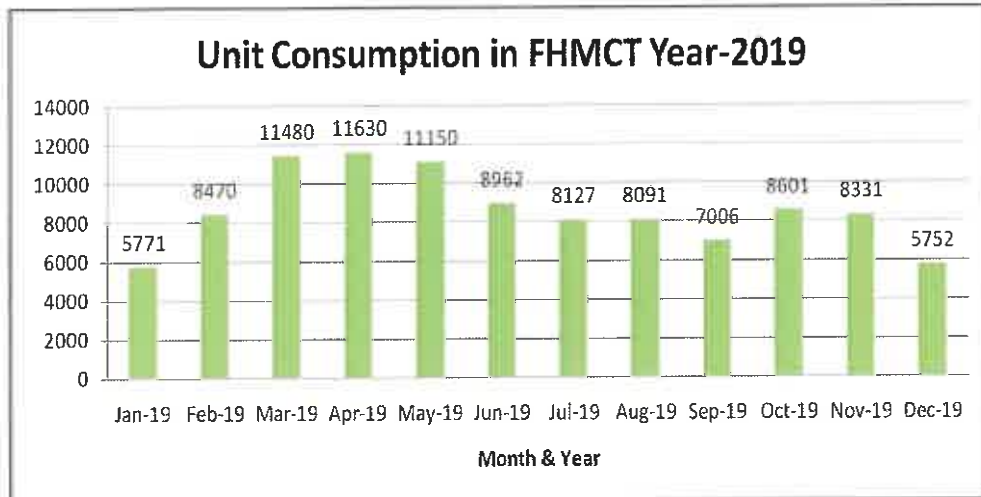
Graphical presentation of energy consumption ALC building year-2019



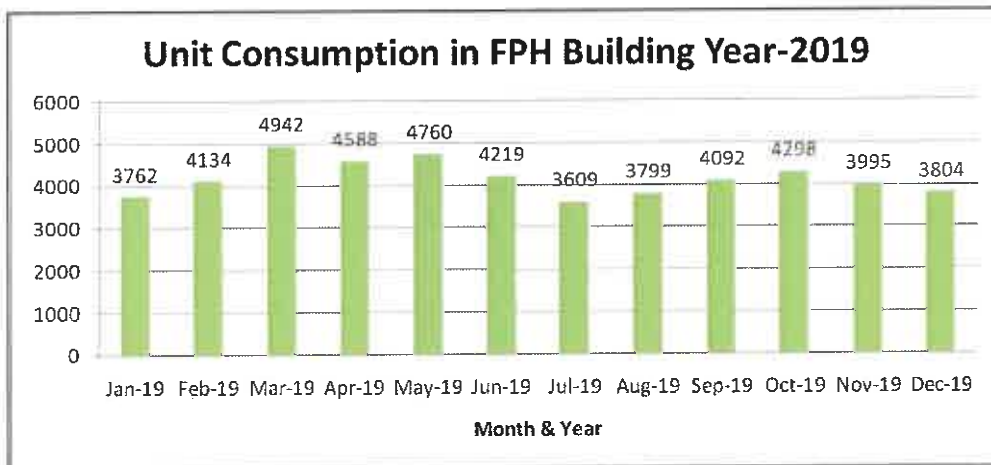
Graphical presentation of energy consumption FDS building year-2019



Graphical presentation of energy consumption FMC building year-2019



Graphical presentation of energy consumption FHMTTC building year-2019



Graphical presentation of energy consumption FPH building year-2019

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CONNECTED LOAD SYSTEM

Lighting Details of the GG Campus are as below

| UAS HOUSE | | | | | | | | | | | | | |
|-----------|--------------------------|-----|------|------|------|------|-----------|---------------|-----------|-----------|-----------|-----------|-------|
| Sr. No | Item Description | 9 W | 15 W | 18 W | 20 W | 36 W | Base ment | Groun d floor | 1st floor | 2nd floor | 3rd floor | 4th floor | Total |
| 1 | 2' X 2' LED pannel light | 0 | 0 | 0 | 0 | 36 | 0 | 57 | 13 | 83 | 0 | 0 | 153 |
| 2 | 4 Feet LED batten light | 0 | 0 | 18 | 0 | 0 | 0 | 20 | 0 | 31 | 0 | 0 | 51 |
| 3 | 1' X 1' LED lights | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| FDS | | | | | | | | | | | | | |
|--------|-------------------------|-----|------|------|------|------|-----------|---------------|-----------|-----------|-----------|-----------|-------|
| Sr. No | Item Description | 9 W | 15 W | 18 W | 20 W | 36 W | Base ment | Groun d floor | 1st floor | 2nd floor | 3rd floor | 4th floor | Total |
| 1 | 2' X 2' LED panel light | 0 | 0 | 0 | 0 | 36 | 0 | 84 | 68 | 65 | 0 | 0 | 217 |
| 2 | 4 Feet LED batten light | 0 | 0 | 18 | 0 | 0 | 0 | 2 | 0 | 0 | 3 | 0 | 2 |
| 3 | 1' X 1' LED lights | 0 | 0 | 0 | 20 | 0 | 0 | 13 | 3 | 1 | 10 | 0 | 27 |

| Faculty of Pharmacy | | | | | | | | | | | | | |
|---------------------|-------------------------|-----|------|------|------|------|-----------|---------------|-----------|-----------|-----------|-----------|-------|
| Sr. No | Item Description | 9 W | 15 W | 18 W | 20 W | 36 W | Base ment | Groun d floor | 1st floor | 2nd floor | 3rd floor | 4th floor | Total |
| 1 | 2' X 2' LED panel light | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 4 Feet LED batten light | 0 | 0 | 18 | 0 | 0 | 0 | 28 | 75 | 31 | 0 | 0 | 134 |
| 3 | 1' X 1' LED lights | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | LED lights | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 | LED lights | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |


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| Faculty of Hospitality Management & Catering technology | | | | | | | | | | | | | |
|---|-------------------------|-----|------|------|------|------|----------|--------------|-----------|-----------|-----------|-----------|-------|
| Sr. No | Item Description | 9 W | 15 W | 18 W | 20 W | 36 W | Basement | Ground floor | 1st floor | 2nd floor | 3rd floor | 4th floor | Total |
| 1 | 2' X 2' LED panel light | 0 | 0 | 0 | 0 | 36 W | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 4 Feet LED batten light | 0 | 0 | 18 W | 0 | 0 | 20 | 13 | 13 | 4 | 0 | 0 | 30 |
| 3 | 1' X 1' LED lights | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 16 | 22 | 0 | 0 | 70 |

Part-02 (Ramaiah Technology Campus)

POWER SUPPLY SYSTEM

There are two main electricity connections one is 750 KVA (M/S MSR & SONS INVESTMENTS LTD.) and second is 200 KVA (M/S Brindavan Alloys Limited). This campus has one transformer details are below

| Sr. No. | Items | Technical Details Transformer (TR) |
|---------|-------------------------|--|
| 1 | Make | (KPRS) Kiran Power Rectification Services (P) Ltd. |
| 2 | Location | Ramaiah Technology Campus |
| 3 | Year | 2010 |
| 4 | Rating (KVA) | 1000 |
| 5 | Voltage (HV/ LV) | 11000/433 |
| 6 | Current Rating (HV/ LV) | 52.24/1391.20 |
| 7 | Frequency (Hz) | 50 |
| 8 | Impedance at 75°C | 5.48 % |
| 9 | Vector group | Dyn-11 |
| 10 | Type of cooling | ONAN |

DG Sets

The GG Campus has 03 Nos. DG sets one is 100 KVA for workshop block and 2 is 250 KVA respectively for main buildings to supply emergency power during the grid power failure.


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Grid Connected Solar Photovoltaic System (35 KWp)

There is a 35 KWp solar photovoltaic rooftop grid-connected system installed on various buildings. System details are given below:

Solar plant detailed

| Sr. No | Parameter | Technical Details |
|--------|--------------------|-------------------|
| 1 | Make | Tata Power Solar |
| 2 | Solar Capacity | 35 KWp |
| 3 | Type | On Grid Type |
| 4 | Nos. of PV Modules | 66Nos. |
| 5 | Solar Inverter | 30 KWp (Goodwe) |

UPS System

University has used UPS system for emergency power supply. Details are given below.

| Sr.No. | Location | KVA |
|--------|---------------------|------------|
| 1 | Incubation Centre | 40 |
| 2 | A Block | 160 |
| 3 | B Block | 120 |
| 4 | C & D Block | 80 |
| 5 | Workshop Block | 35 |
| 6 | Techno Centre Block | 20 |
| | Total | 455 |



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ELECTRICITY BILL ANALYSIS BILL ANALYSIS OF 200 KVA CONNECTIONS.

Energy audit team was analysed Electricity bills of last one year- 2019 (Ramaiah Technology Campus).

| Sr. No. | Month & Year | Contract Demand (KVA) | Fixed Demand (KVA) | Maximum Demand(KVA) |
|---------|--------------|-----------------------------|--------------------|---------------------|
| 1 | Jan-19 | 200 | 170 | 43 |
| 2 | Feb-19 | 200 | 170 | 17 |
| 3 | Mar-19 | 200 | 170 | 25 |
| 4 | Apr-19 | 200 | 170 | 34 |
| 5 | May-19 | 200 | 170 | 35 |
| 6 | Jun-19 | 200 | 170 | 20 |
| 7 | Jul-19 | 200 | 170 | 44 |
| 8 | Aug-19 | 200 | 170 | 23 |
| 9 | Sep-19 | 200 | 170 | 27 |
| 10 | Oct-19 | 200 | 170 | 41 |
| 11 | Nov-19 | 200 | 170 | 33 |
| 12 | Dec-19 | 200 | 170 | 24 |
| | | Minimum Demand (KVA) | | 17 |
| | | Maximum Demand (KVA) | | 44 |
| | | Average Demand (KVA) | | 30.50 |



Figure: - Graphical Presentation of Demand analysis year-2019

Observation:

It was observed that the contract demand of the campus is 200 KVA. There is a variation in maximum demand. It is a maximum of 44 KVA in the Month of Jul-2019 and a minimum of 17 KVA in Feb- 2019

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Monthly Power factor analysis Year-2019

| Sr. No. | Month & Year | Power Factor |
|--------------|--------------|--------------|
| 1 | Jan-19 | 0.95 |
| 2 | Feb-19 | 0.99 |
| 3 | Mar-19 | 0.99 |
| 4 | Apr-19 | 0.98 |
| 5 | May-19 | 0.96 |
| 6 | Jun-19 | 0.88 |
| 7 | Jul-19 | 0.74 |
| 8 | Aug-19 | 0.85 |
| 9 | Sep-19 | 0.86 |
| 10 | Oct-19 | 0.97 |
| 11 | Nov-19 | 0.98 |
| 12 | Dec-19 | 0.98 |
| Total | | 0.93 |

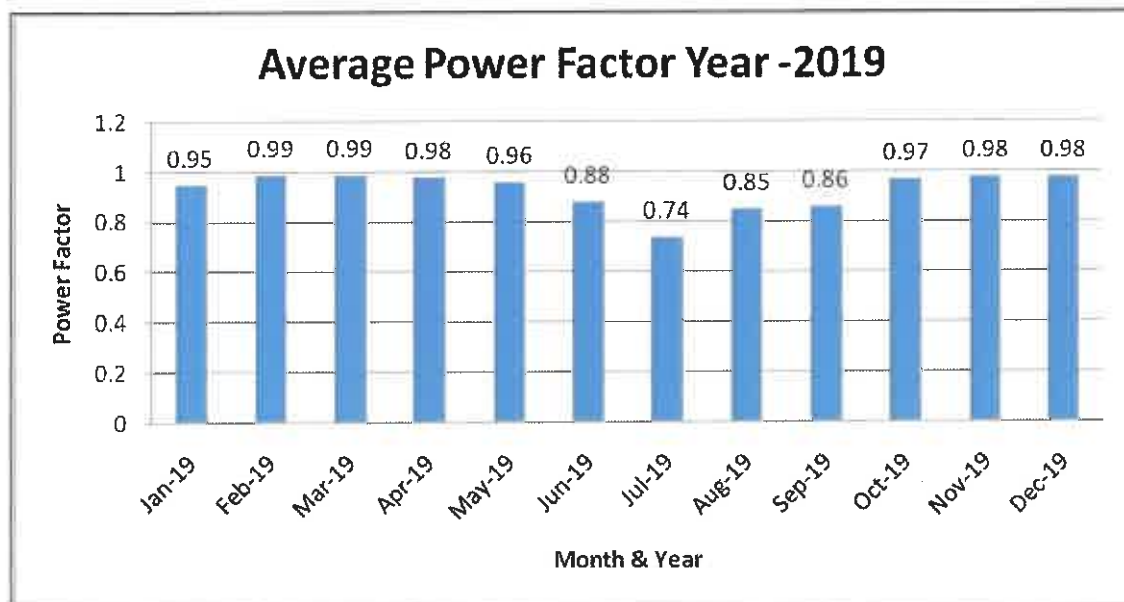


Figure Graphical presentation of average power factor year 2019

Observation:

The average power factor was 0.93 form Jan -2019 to Dec -2019. It is recommended to maintain power factor unity or 0.995.


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Monthly electrical energy consumption year 2019

The monthly electrical consumption for the RTC campus is given in the table.

| Sr. No. | Month & Year | Unit Consumption (kWh) | Amount (Rs.) | Overall per unit charges (Rs. / kWh) |
|--------------|--------------|------------------------|-------------------|--------------------------------------|
| 1 | Jan-19 | 5,330 | 90720/- | 17.02 |
| 2 | Feb-19 | 2,870 | 67,102/- | 23.38 |
| 3 | Mar-19 | 3,080 | 69,430/- | 22.54 |
| 4 | Apr-19 | 3,660 | 74,975/- | 20.48 |
| 5 | May-19 | 4,170 | 64,958/- | 15.58 |
| 6 | Jun-19 | 3,440 | 79,938/- | 23.24 |
| 7 | Jul-19 | 4,970 | 93,276/- | 18.77 |
| 8 | Aug-19 | 3,830 | 80,208/- | 20.94 |
| 9 | Sep-19 | 3,210 | 73,560/- | 22.92 |
| 10 | Oct-19 | 3,170 | 72,739/- | 22.95 |
| 11 | Nov-19 | 3,680 | 77,818/- | 21.15 |
| 12 | Dec-19 | 3,530 | 76,036/- | 21.54 |
| Total | | 44,940 | 9,20,760/- | 20.88 |

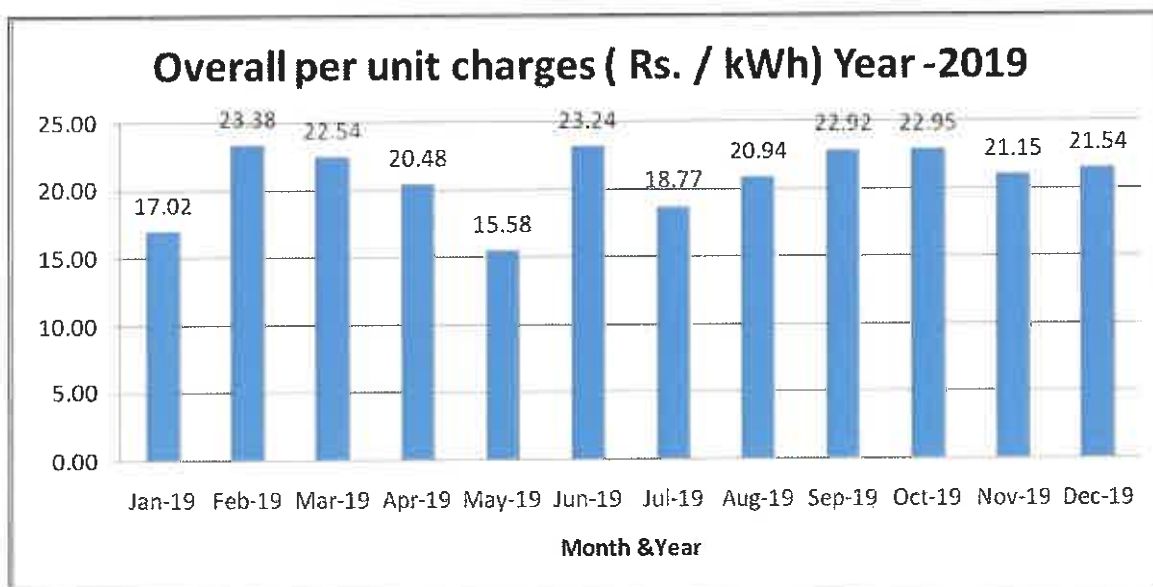


Figure: - Graphical presentation of actual per-unit charges for the year -2019

Observation:

It was found that total energy consumption in the last one year was 44,940 units. The average annual energy charge is Rs 20.88 /kWh.


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BILL ANALYSIS OF 750 KVA KVA CONNECTIONS.

Energy audit team was analysed Electricity bills of last one year- 2019(Ramaiah Technology Campus).The details of sanctioned load 750 KVA are as below

| Sr. No. | Month & Year | Contract Demand (KVA) | Fixed Demand (KVA) | Maximum Demand (KVA) |
|---------|--------------|-----------------------------|--------------------|----------------------|
| 1 | Jan-19 | 750 | 638 | 310 |
| 2 | Feb-19 | 750 | 638 | 289 |
| 3 | Mar-19 | 750 | 638 | 324 |
| 4 | Apr-19 | 750 | 638 | 321 |
| 5 | May-19 | 750 | 638 | 279 |
| 6 | Jun-19 | 750 | 638 | 236 |
| 7 | Jul-19 | 750 | 638 | 227 |
| 8 | Aug-19 | 750 | 638 | 238 |
| 9 | Sep-19 | 750 | 638 | 292 |
| 10 | Oct-19 | 750 | 638 | 320 |
| 11 | Nov-19 | 750 | 638 | 311 |
| 12 | Dec-19 | 750 | 638 | 256 |
| | | Minimum Demand (KVA) | | 227 |
| | | Maximum Demand (KVA) | | 324 |
| | | Average Demand (KVA) | | 283.58 |

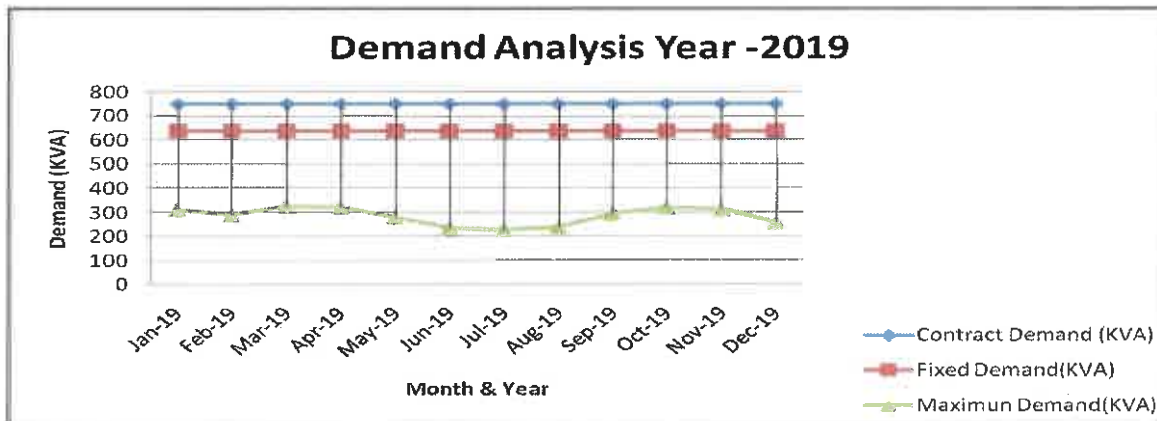


Figure: - Graphical Presentation of Demand analysis year-2019

Observation: It was observed that the contract demand of the campus is 750 KVA. There is a variation in maximum demand. It is a maximum of 324 KVA in the Month of Mar -2019 and a minimum of 227 KVA in Jul – 2019


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Monthly Power factor analysis Year-2019

| Sr. No. | Month & Year | Power Factor |
|--------------|--------------|--------------|
| 1 | Jan-19 | 0.92 |
| 2 | Feb-19 | 0.94 |
| 3 | Mar-19 | 0.93 |
| 4 | Apr-19 | 0.93 |
| 5 | May-19 | 0.93 |
| 6 | Jun-19 | 0.92 |
| 7 | Jul-19 | 0.92 |
| 8 | Aug-19 | 0.92 |
| 9 | Sep-19 | 0.93 |
| 10 | Oct-19 | 0.93 |
| 11 | Nov-19 | 0.94 |
| 12 | Dec-19 | 0.94 |
| Total | | 0.93 |

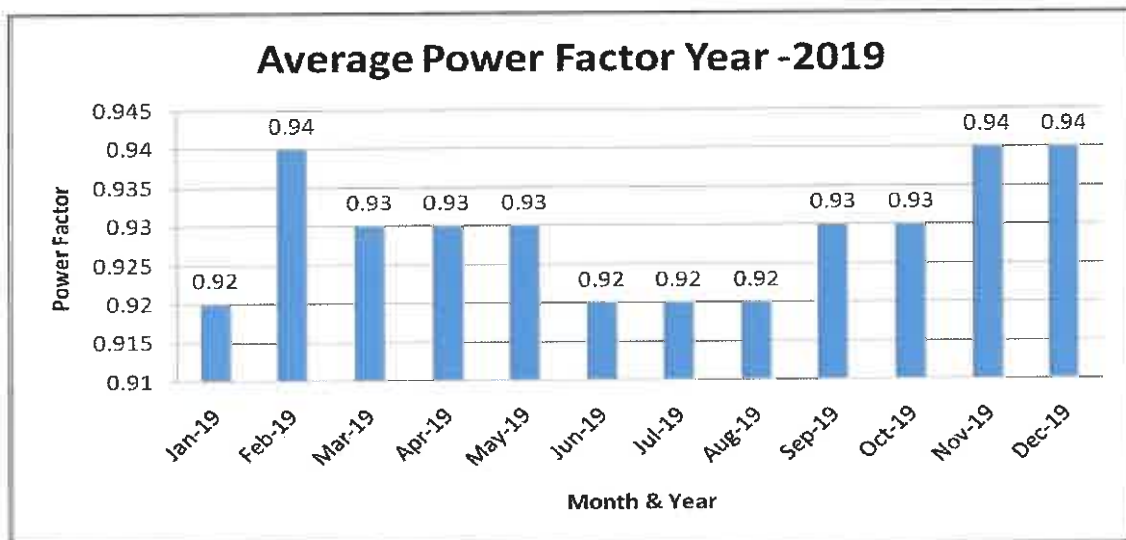


Figure Graphical presentation of average power factor year 2019

Observation:

The average power factor was 0.93 form Jan -2019 to Dec -2019. It is recommended to maintain power factor unity or 0.995


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Monthly electrical energy consumption 2019

The monthly electrical consumption for the campus is given in the table.

| Sr. No. | Month & Year | Unit Consumption (kWh) | Amount (Rs.) | Overall per unit charges (Rs. / kWh) |
|--------------|--------------|------------------------|--------------------|--------------------------------------|
| 1 | Jan-19 | 77,840 | 9,07,986 | 11.66 |
| 2 | Feb-19 | 71,880 | 8,44,894 | 11.75 |
| 3 | Mar-19 | 87,040 | 10,00,555 | 11.50 |
| 4 | Apr-19 | 84,040 | 8,13,695 | 9.68 |
| 5 | May-19 | 83,880 | 8,90,540 | 10.62 |
| 6 | Jun-19 | 71,640 | 9,01,886 | 12.59 |
| 7 | Jul-19 | 71,600 | 8,77,167 | 12.25 |
| 8 | Aug-19 | 73,040 | 8,92,577 | 12.22 |
| 9 | Sep-19 | 78,720 | 9,44,356 | 12.00 |
| 10 | Oct-19 | 75,320 | 9,09,696 | 12.08 |
| 11 | Nov-19 | 87,840 | 10,36,623 | 11.80 |
| 12 | Dec-19 | 85,520 | 10,04,949 | 11.75 |
| Total | | 9,48,360 | 1,10,24,924 | 11.66 |

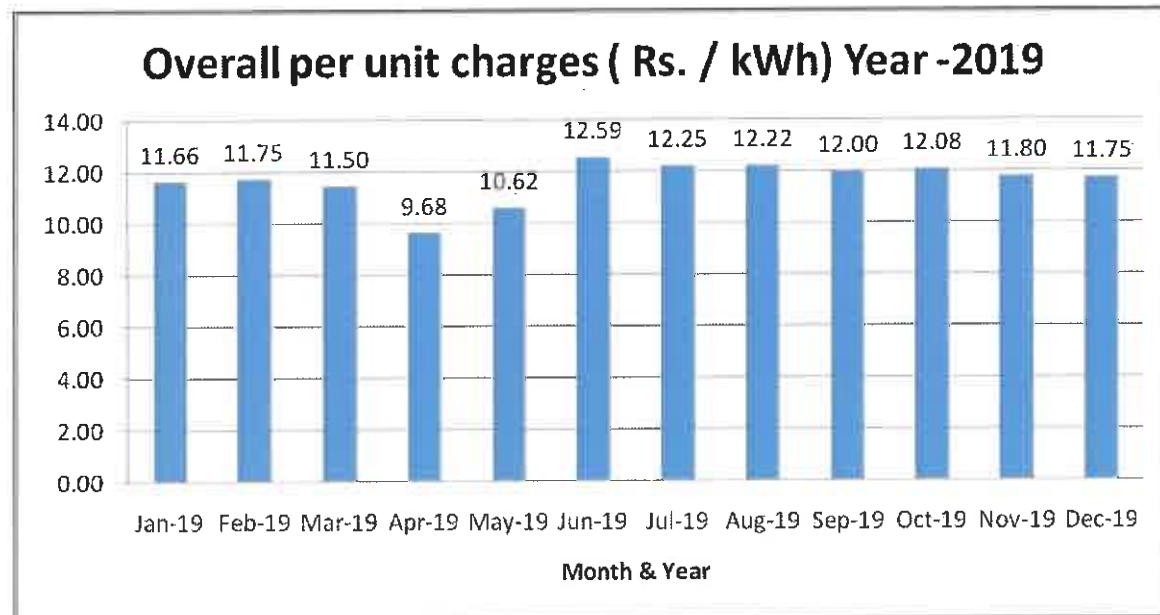


Figure: - Graphical presentation of actual per-unit charges for the year -2019

Observation:

It was found that total energy consumption in the last one-year months was 9, 48,360 units. The average annual energy charge is Rs 11.66 /kWh. It is higher side due to demand not utilized.


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IV. Water Audit

A water audit stands out as a crucial management tool, effectively minimizing losses, optimizing diverse uses, and promoting significant water conservation. The campus's unwavering commitment to efficient water usage and management is evident through various initiatives, ensuring satisfaction and eliminating unnecessary water wastage.

Throughout the survey, no instances of water wastage were observed. The expansive open grounds, adorned with abundant greenery, play a vital role in water percolation, eliminating barren areas. The campus is equipped with a functional rainwater harvesting unit that efficiently utilizes collected water for various campus needs. Additionally, all wastewater generated within the campus undergoes treatment in a fully operational Sewage Treatment Plant, and the treated water finds reuse for gardening purposes within the university. This comprehensive approach underscores the campus's dedication to responsible water management and sustainability.

i. Water Conservation

| Control Objective | Control (s) | Compliances (Please answer Yes/No). If Yes please explain the process and procedure. |
|--|--|---|
| To maximise the proportion of water that is stored and recycled and minimise the quantity of non-recyclable refuse | List the uses of water in your Institute | Gardening, Flushing, Washing hands and Utensils, Cleaning , Laboratories, Cooking, Drinking |
| To maximise the proportion of water that is stored and recycled and minimise the quantity of non-recyclable refuse | Water is stored in your Institute. Water saving techniques are followed in your Institute. | Tanks & Sumps, Urinal Sensors, Water level controller, Ball walls and sensors |
| To maximise the proportion of water that is stored and | Water wastage is prevented or stopped in the Institute. | 1 Plumbers/ campus are appointed. They are available on Speed Dial. If any complaints on |

| | | |
|--|--|--|
| recycled and minimise the quantity of non-recyclable refuse | | leakage, blockage, and overflow is raised, they immediately attend to the complaint and maintain records. Automatic controller is employed to prevent over flooding of the water in the tank 2 |
| To maximise the proportion of water that is stored and recycled and minimise the quantity of non-recyclable refuse | Locate the entry and exit point of water in your Institute. | GG Campus: Gate no. 5 -Entry Gate no.5 -Exit Peenya Campus: Gate no.2- Entry Gate no. 5: Exit |
| To maximise the proportion of water that is stored and recycled and minimise the quantity of non-recyclable refuse | List the ways that could reduce the amount of water used in the Institute. | The recycled water from STP is used for flushing of toilets and for Gardening purposes An aquarium with natural cleaning technology is proposed |
| To maximise the proportion of water that is stored and recycled and minimise the quantity of non-recyclable refuse | Is rain water harvesting carried out in the Institute. | Yes. 2 RWH points per campus Peenya: 1,50,000 litres capacity |
| To maximise the proportion of water that is stored and recycled and minimise the quantity of non-recyclable refuse | Is there a water recycling system in the Institute. | YES. STP- (45okld)- GG campus STP-(5okld)- Peenya STP unit of 40,000 litres per day capacity is used for treating the water and for re-use in the toilets flushing and for the gardening purpose. |


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ii. Water consumption record for the past 3 months.

Please provide details in the below table format. Also, please provide water bills for past 3 months. Water Supply and Usage

The university fulfills its water requirements primarily through strategically positioned bore wells, totaling six across the campus. These bore wells play a crucial role as vital reservoirs, guaranteeing a steady water supply throughout the year. In a proactive measure to enhance groundwater sustainability, the university has introduced recharge structures for all bore wells. These structures facilitate the percolation of rainwater and surface runoff into the ground, actively contributing to the preservation of groundwater resources. This approach exemplifies the university's dedication to efficient water management and the conservation of valuable resources.

| Sl No | Month | Time of the day | Water Consumed | | |
|----------------------------|-----------------|-----------------|----------------|------------|---------|
| Month: OCTOBER 2019 | | | | | |
| Date | Initial Reading | Final Reading | Difference | Cumulative | Remarks |
| 1 | 162446 | 162482 | 36 | 36 | |
| 2 | 162482 | 162499 | 17 | 53 | |
| 3 | 162499 | 162523 | 24 | 77 | |
| 4 | 162523 | 162571 | 48 | 125 | |
| 5 | 162571 | 162589 | 18 | 143 | |
| 6 | 162589 | 162613 | 24 | 167 | |
| 7 | 162613 | 162688 | 75 | 242 | |
| 8 | 162688 | 162705 | 17 | 259 | |
| 9 | 162705 | 162832 | 127 | 386 | |
| 10 | 162832 | 162896 | 64 | 450 | |
| 11 | 162896 | 162930 | 34 | 484 | |
| 12 | 162930 | 162972 | 42 | 526 | |
| 13 | 162972 | 162993 | 21 | 547 | |
| 14 | 162993 | 163103 | 110 | 657 | |
| 15 | 163103 | 163117 | 14 | 671 | |
| 16 | 163117 | 163169 | 52 | 723 | |
| 17 | 163169 | 163185 | 16 | 739 | |
| 18 | 163185 | 163206 | 21 | 760 | |
| 19 | 163206 | 163251 | 45 | 805 | |
| 20 | 163251 | 163294 | 43 | 848 | |
| 21 | 163294 | 163307 | 13 | 861 | |
| 22 | 163307 | 163324 | 17 | 878 | |


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| | | | | | |
|----|--------|--------|----|------|--|
| 23 | 163324 | 163361 | 37 | 915 | |
| 24 | 163361 | 163392 | 31 | 946 | |
| 25 | 163392 | 163409 | 17 | 963 | |
| 26 | 163409 | 163427 | 18 | 981 | |
| 27 | 163427 | 163452 | 25 | 1006 | |
| 28 | 163452 | 163479 | 27 | 1033 | |
| 29 | 163479 | 163491 | 12 | 1045 | |
| 30 | 163491 | 163508 | 17 | 1062 | |
| 31 | 163508 | 163546 | 38 | 1100 | |

| Month: NOVEMBER 2019 | | | | | |
|----------------------|-----------------|---------------|------------|------------|---------|
| Date | Initial Reading | Final Reading | Difference | Cumulative | Remarks |
| 1 | 163546 | 163591 | 45 | 45 | |
| 2 | 163591 | 163623 | 32 | 77 | |
| 3 | 163623 | 163654 | 31 | 108 | |
| 4 | 163654 | 163690 | 36 | 144 | |
| 5 | 163690 | 163708 | 18 | 162 | |
| 6 | 163708 | 163727 | 19 | 181 | |
| 7 | 163727 | 163769 | 42 | 223 | |
| 8 | 163769 | 163798 | 29 | 252 | |
| 9 | 163798 | 163813 | 15 | 267 | |
| 10 | 163813 | 163840 | 27 | 294 | |
| 11 | 163840 | 163883 | 43 | 337 | |
| 12 | 163883 | 163905 | 22 | 359 | |
| 13 | 163905 | 163941 | 36 | 395 | |
| 14 | 163941 | 163964 | 23 | 418 | |
| 15 | 163964 | 163993 | 29 | 447 | |
| 16 | 163993 | 164100 | 107 | 554 | |
| 17 | 164100 | 164131 | 31 | 585 | |
| 18 | 164131 | 164154 | 23 | 608 | |
| 19 | 164154 | 164172 | 18 | 626 | |
| 20 | 164172 | 164193 | 21 | 647 | |
| 21 | 164193 | 164206 | 13 | 660 | |
| 22 | 164206 | 164231 | 25 | 685 | |
| 23 | 164231 | 164254 | 23 | 708 | |
| 24 | 164254 | 164271 | 17 | 725 | |
| 25 | 164271 | 164297 | 26 | 751 | |
| 26 | 164297 | 164309 | 12 | 763 | |
| 27 | 164309 | 164323 | 14 | 777 | |


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| | | | | | |
|----|--------|--------|----|-----|--|
| 28 | 164323 | 164351 | 28 | 805 | |
| 29 | 164351 | 164370 | 19 | 824 | |
| 30 | 164370 | 164394 | 24 | 848 | |

| Month: DECEMBER 2019 | | | | | |
|----------------------|-----------------|---------------|------------|------------|---------|
| Date | Initial Reading | Final Reading | Difference | Cumulative | Remarks |
| 1 | 164394 | 164410 | 16 | 16 | |
| 2 | 164410 | 164431 | 21 | 37 | |
| 3 | 164431 | 164463 | 32 | 69 | |
| 4 | 164463 | 164492 | 29 | 98 | |
| 5 | 164492 | 164511 | 19 | 117 | |
| 6 | 164511 | 164540 | 29 | 146 | |
| 7 | 164540 | 164593 | 53 | 199 | |
| 8 | 164593 | 164611 | 18 | 217 | |
| 9 | 164611 | 164630 | 19 | 236 | |
| 10 | 164630 | 164672 | 42 | 278 | |
| 11 | 164672 | 164697 | 25 | 303 | |
| 12 | 164697 | 164714 | 17 | 320 | |
| 13 | 164714 | 164730 | 16 | 336 | |
| 14 | 164730 | 164754 | 24 | 360 | |
| 15 | 164754 | 164791 | 37 | 397 | |
| 16 | 164791 | 164820 | 29 | 426 | |
| 17 | 164820 | 164842 | 22 | 448 | |
| 18 | 164842 | 164874 | 32 | 480 | |
| 19 | 164874 | 164898 | 24 | 504 | |
| 20 | 164898 | 164924 | 26 | 530 | |
| 21 | 164924 | 164950 | 26 | 556 | |
| 22 | 164950 | 164994 | 44 | 600 | |
| 23 | 164994 | 165100 | 106 | 706 | |
| 24 | 165100 | 165141 | 41 | 747 | |
| 25 | 165141 | 165167 | 26 | 773 | |
| 26 | 165167 | 165185 | 18 | 791 | |
| 27 | 165185 | 165214 | 29 | 820 | |
| 28 | 165214 | 165244 | 30 | 850 | |
| 29 | 165244 | 165261 | 17 | 867 | |
| 30 | 165261 | 165297 | 36 | 903 | |
| 31 | 165297 | 165316 | 19 | 922 | |


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WATER CONSUMPTION & WATER SOURCES

As a primary data collected by survey, we found

| Sr. No. | Particulars | Details |
|---------|----------------------------|---------|
| 1 | Students staying at Hostel | 150 |
| 2 | Students at College | 1168 |
| 3 | Teaching Staff | 368 |
| 4 | Non-Teaching Staff | 315 |
| 5 | Visitors | 150 |
| | Total | 2294 |

Estimation of water requirement for drinking & domestic use as per (Source: NBC 2016, BIS)

| Sr. No. | Particulars | Details | Water Consume limit | Total water in lit/day |
|---------|----------------------------|---------|---------------------|------------------------|
| 1 | Students staying at Hostel | 150 | 135 lit/day | 6750 |
| 2 | Students at College | 1168 | 45 lit/day | 52560 |
| 3 | Teaching Staff | 368 | 45 lit/day | 16560 |
| 4 | Non-Teaching Staff | 315 | 45 lit/day | 14175 |
| 5 | Visitors | 150 | 15 lit/day | 2250 |
| | Total | 2294 | | 92229 |

Total expected Water consumption as per NBC 2016, BIS for MSRUS is – 92.22 m³/day.



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Actual Water Uses – (Both Campuses)

| Sr. No. | Description | Water Consumption (m ³ /day) | Source/Remark |
|---------|--------------|---|--|
| 1 | Domestic | | 1.BWSSB |
| | a) Hospital | 400 | 2.Ground Water |
| | b) College | 150 | |
| | c) Hostel | 10.7 | |
| 2 | Laundry | 20 | |
| 3 | Lab Washing | 10 | |
| 4 | Miscellanies | 10 | Fresh Water |
| | Total | 600 | |
| 5 | Gardening | 20 | Treated/Recycle Water from STP Plant |
| 6 | Flushing | 80 | |
| | | 700 | (Fresh Water & Treated Water From STP) |



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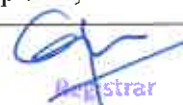
V. Waste Management Audit

M. S. Ramaiah University of Applied Sciences is committed to promoting environmentally responsible practices, and one key area where this commitment is evident is in its waste management strategies. By implementing a range of initiatives, the university aims to reduce its environmental impact, minimize landfill contributions, and foster a culture of sustainability among its students and staff.

| Type | Present near the Institute (Yes/No) If Yes, mention the distance from the campus in Km | |
|-----------------------------|---|--|
| | GG campus | Peenya campus |
| Municipal Dump Yard | No | No |
| Garbage Heap | No | No |
| Sewer Line | No | No |
| Stagnant Water | No | No |
| Open Drainage | No | No |
| Industry (Mention the type) | Yes 3 km (BEL, HMT) | Yes within 1 km (manufacturing, aeronautical, garments, automobile industry) |
| Bus Station | Yes 0.5 km | Yes 0.5 km |
| Railway Station | Yes 2-3 kms | Yes 7kms |
| Public Convenience | Yes 1-2 kms | Yes 1-2 kms |

Waste Minimization and Recycling

| Type of waste | Generated (Yes/no) |
|--------------------|--|
| Solid Waste | Yes- eatables |
| Paper Waste | Yes-plates, printouts, files, books, manuals |
| Plastic Waste | Yes- bottles, carry bags, containers |
| Toiletry Waste | Yes- sanitary napkins, tissues |
| Horticulture Waste | Yes- leaves, dead plants, trimmed branches |



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Waste Generated

| Type of Waste Generated | Amount of waste generated (kg/month) | |
|-------------------------|--------------------------------------|---------------------------------|
| | GG campus | Peenya campus |
| Bio-Degradable | N.A | 350kg |
| Non-Biodegradable | 50 Kgs | 50kg |
| Hazardous | 10 Kgs | 10 litres/month of waste diesel |
| Others | 05 Kgs sanitary pads | 1kg/month sanitary pads |

Waste Management.

| Waste Management Technique | Description | |
|----------------------------|--|--|
| | GG Campus | Peenya Campus |
| Composting | | All the dry leaves shreds from the plants and trees are collected and wind row composting is done at the back yard of the campus |
| Recycling | STP | STP |
| Reusing | Single side printed sheets are reused for taking draft print outs and for internal circulation | Single side printed sheets are reused for taking draft print outs and for internal circulation |
| Others (Specify) | Nil | Nil |



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Recycling and Reusing.

| Question | Answer (Yes/No) | Describe the process if yes |
|--|-----------------|--|
| Is recycled paper used in your Institute? | No | |
| Is reused paper used in your Institute? | Yes | For packing One side printed papers are used for writing and personal reference printing by 70% of employees |
| Is the message of importance of recycling spread to others in your community? If yes, specify the initiatives taken. | Yes | Recycling process and awareness program details are posted in several places of the campus. Every employees email signature has a message 'Don't waste recycle' 'Print only if necessary' |
| Is it possible to achieve zero garbage in your institute? If yes, describe how. | No | |


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VI. Biodiversity Audit

A thorough scientific survey of the campus's plant and animal life was conducted throughout the rainy, winter, and summer seasons in 2022, constituting a comprehensive biodiversity audit. This examination revealed significant findings, including the identification of numerous tree species and a diverse array of mammals, birds (Aves), arthropods, and annelids. These findings highlight the remarkable diversity of flora and fauna flourishing on the campus.

Noteworthy among the discoveries is the seasonal influx of various bird species, contributing to the ecological significance of the campus. In a commendable initiative, the institution has taken steps to label trees and plants with their botanical names and assign unique numerical identifiers. This concerted effort aligns with the broader goal of preserving and celebrating the campus's rich biodiversity, aiming to foster a deeper appreciation for the natural world.

Green Campus

Horticulture and plant as per the table format.

| Question | Answer(Yes/No) | Description |
|---|----------------|---|
| Is there a horticulture department present in your campus? | Yes | A separate horticulture team is managing the garden area of the campus |
| How many staff is present in the Horticulture Department? | 05 | 01-Asst. Facility Manager 01-Supervisor 03-Gardeners |
| Plant distribution program is organised for the students and community? | Yes | For 80% of the events/ programs Chief Guests and visitors are felicitated with a plant/ sapling instead of bouquet. Also the trainer/ faculty conducting workshops for Intra department / faculty is gifted with a sapling/ plantation as a token of gratitude |
| Is there a plant ownership program? | Yes | List is prepared |

VII. Best Practice/Initiative

Best Practices/Initiatives

Some best practices/initiatives taken by the institution in the below table format.

| Sl No | Best Practice/Initiative | Description |
|--------------|---------------------------------|---|
| 1 | Renewable Energy | Solar panels have been installed in both campus, Bio gas plant has been installed in Peenya campus |
| 2 | Biodiversity Conservation | Both campus are surrounded with luscious green beds. The trees are home for variety of birds like Crows Pigeon, Mynah, and Nightingale. Peacock also can be found near Peenya campus area. The species are not disturbed or hurt in any manner. |
| 3 | Tree Plantation Drives | NSS has participated in tree plantation drives. Two drives has been conducted. As a part of Service to Society every year students reach out to nearby streets, areas, towns and villages and plant trees. |
| 4 | Ground Water Recharge | Done in Peenya campus |
| 5 | Pollution Reduction | Car-pooling, Usage of battery operated vehicles and bicycles |
| 6 | E-Waste Management | Yes, unused and old electronic equipments are sold to authorised E-Waste scrap dealer |
| 7 | Solid Waste Management | Every faculty has separate bins for Dry, wet and hazardous. These are handed over to authorised dealers |
| 8 | Adoption of Village/Society | 05 villages (kaiwara, Rajgere, Mallur, Kannalli and Jakkanalli of Karnataka) across karnatka are adopted under Unnat Bharath Abhiyan Scheme to support for the technical development of the villages |
| 9 | Corporate Resource Center | No |


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Built Environment Sustainability & Transformation